Response to EPA Comments Dated December 18, 2018

Draft Co-location of Dioxin/Furans and Aroclor 1268, Operable Unit One (OU1): LCP Chemicals Superfund Site, Brunswick, Glynn County, Georgia

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General Comments

Switching between PCDD/F homologs and congeners is confusing. Although both can be summarized in tables, only one or the other should be used for evaluating co-location. Currently it is confusing which is being used in the statistical evaluations.

Response

The memorandum is revised to reference homologues when evaluating co-location. Summed total homologues are used for the 'a' cases and total furans for the 'b' cases.

EPA is in agreement with the memo's assessment that a moderate correlation has been shown between the historical and 2018 PCDD/F, and Aroclor 1268 concentrations. This moderate correlation would imply co-location of PCDD/F and Aroclor 1268. Additional statistical analysis such a regression analysis, including diagnostic testing to identify potential outliers/leverage points would be needed to ensure that cleaning up for Aroclor 1268 would also reduce dioxin furan concentrations to acceptable levels. To accomplish this, Cook's Distance analysis and examination of residuals are recommended.

Response

The revised memorandum includes an examination of linear regression assumptions (zero conditional mean of errors, independence of errors, homoscedasticity of errors, and normality of errors) and provides the statistical analyses validating these assumptions for all cases of co-location. To this end, Breusch-Pagan ("BP") Test, White's Test, and iterative Weighted Least Squares analysis were applied. In addition, Cook's Distance analysis was utilized to identify data points with large residuals and/or high leverage that cause heteroscedasticity in the data set. Co-location was evaluated including and excluding outlier/high-leverage observations (as these are not necessarily erroneous), and the results were assessed collectively.

Specific Comments

Section 2.5.1, page 5

The relevance of PCDF (as opposed to PCDDs) association with chlor-alkali electrolytic operations is mentioned only in passing. It is worthwhile to inform the reader unfamiliar with the subject that in recent experiments, high concentrations of PCDFs but no PCDDs were formed in tests using graphite electrodes (Yamamoto et al., 2017). With titanium electrodes, PCDFs were only formed when tar pitch was added and mainly originated from the dibenzofuran present in the tar. The earlier Rappe papers may also be cited.

Response

Reference to the Yamamoto et al and Rappe studies was added in Section 2.5.1.

Section 5.1.2, page 14

In the first two bullets for the Pearson Correlation and the Spearman Rank, it seems that the references to PCDD/F TEQ should be the mass concentration of PCDD/F rather than the TEQ (per note 7 at the bottom of the page).

Response

The revised memorandum references the mass concentration of PCDD/F rather than TEQ.

Section 5.2

The text does not clearly provide the significance for the additional assessment of exclusively PCDF homologues in the co-location analysis. Also, it is not clear why there was not a separate analysis for exclusively PCDD homologues. Please provide the information so that the reader not familiar with the Site is informed.

Response

The assessment of exclusively PCDF homologues provides insight into co-location of the portion of the total PCDD/F believed to be associated with the chloro-alkali process. This rationale is included in Section 5.2.1 of the revised memorandum.

The co-location evaluation should test and discuss all the general assumptions associated with each correlation method, and whether they hold true based on the data. For example, in addition to the linearity assumption for the Pearson correlation, are both variables normally distributed? The results of the ProUCL output indicating that 2018 PCDD/F TEQ data is not normal, may suggest that the 2018 PCDD/F mass concentration data may also not be normal (Case 1a). This may make the use of the Spearman Rank-order Correlation Analysis more appropriate for

Case 1a (providing a stronger case for correlation).

Response

The revised memorandum discusses the assumptions of the Pearson Correlation: normality and linearity of the variables (there are no assumptions for the Spearman Rank-order Correlation analysis). When the assumptions of the Pearson Correlation were not satisfied, a log-transformation was applied to both variables to achieve linearity and normality. Results of the Pearson Correlation are presented with a note indicating log-transformation was applied to achieve the normality and linearity. If the log-transformation failed to achieve normality and linearity of variables, the Pearson Correlation was not utilized.

Section 6, page 17

The bullets in Summary and Conclusion Section 6 are numbered 3 to 5. They should be labelled as 1 to 3.

Response

The conclusions are numbered 1 to 3 in the revised memorandum.

Tables

Tables 1a and 2a contain identical data. Table 1a should include historical sampling PCDD/F concentrations whereas it includes the 2018 data.

Response

Table 1a of the revised memorandum includes historical sampling data and Table 2a includes sampling data for the present co-location study.

For clarity, there should be a summary table with total PCDDs PCDFs (congeners and/or homologs but should be consistent between 2018 and historical data) along with TEQs and Aroclor 1268. It is very difficult to look at tables in report and understand what values are being compared.

Response

The evaluation of co-location is performed using summed total homologues ("a cases") and total furans ("b cases"). These values are provided in the final two columns of Tables 1b and 2b. Tables 1a and 2a provide Aroclor 1268 data, PCDD/F congener data, and TEQs calculated from the congener data.

Please check the TEF for OCDF on Table 1a/2a. It is shown as 0.0001 on Table 1a and Table

2a, but according to EPA guidance and WHO guidance, it was raised to 0.0003 in 2005. The 0.0001 value was the 1996 TEF. Revise or provide justification for using the 1996 TEF versus the 2005 TEF on the table.

Response

The TEF for OCDF was revised to 0.0003 according to the WPA and WHO guidance and TEQs were recalculated. This revision had a negligible impact on calculated TEQs.

Figures

Figure names in the Table of Contents are more descriptive and should be used on the figures.

Response

Titles for figures were revised to match those in the table of contents of the memorandum.

Appendix B

On Case 1a, 2a, and 3a data plots, it appears that the data in the PCCD/F column are the sum of total homologue results on Table 2b, or Table 1b. The sums should be included on Table 2b and Table 1b, since the sums are used in the co-location calculations. Likewise, the summed furans used in Case 1b, 2b, and 3b data plots should be included on Table 2b and Table 1b. For clarity, it is also recommended that the source of the total values in Table 2b be referenced in the table notes (i.e. that the total values are reported from the lab report, Form 1A of the PCDD/PCDF ANALYSIS REPORT).

Response

Tables 1b and 2b are revised to include summed total homologue and furan results and a note that states all homologue results are reported from the lab report.

EPA and split samples during the dioxin fieldwork. The embedded table presents both the results contained in the draft report as well as EPA's. Please add this data to the revised report.

Response

Split sample results have been added to Tables 1b and 2b.